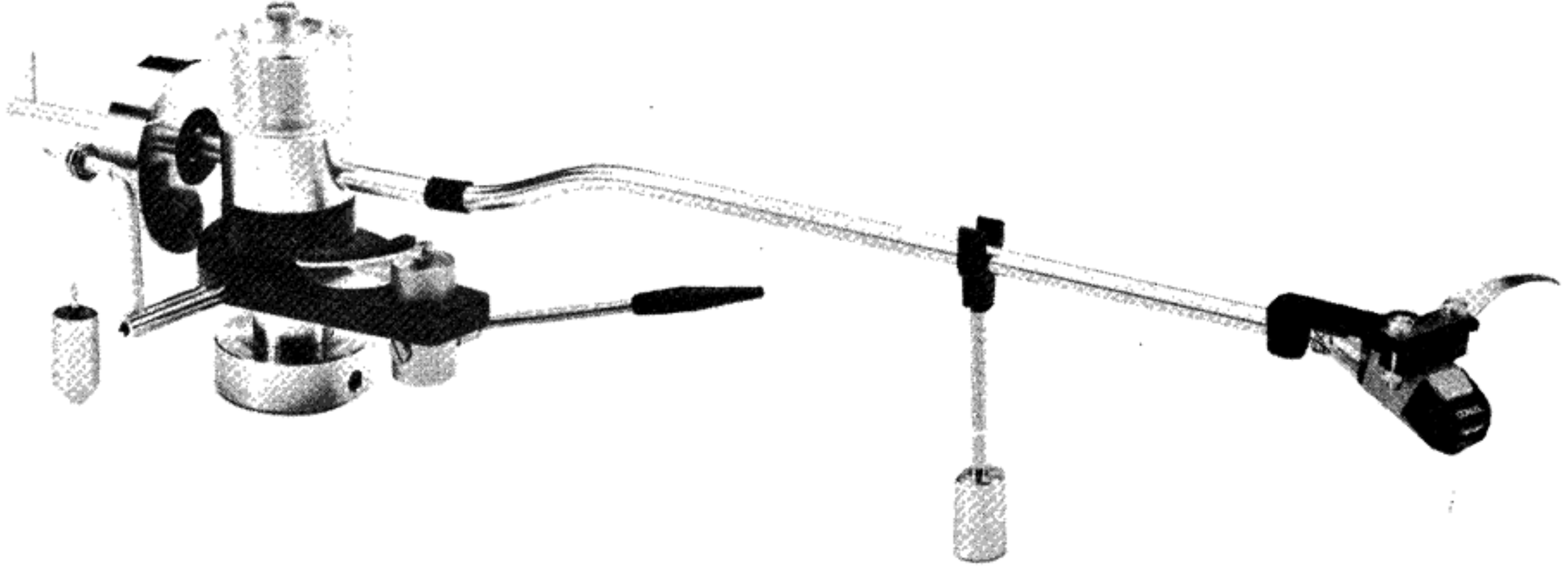
SONUS *Formula IV*



LABORATORY STANDARD TONEARM

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INTRODUCTION

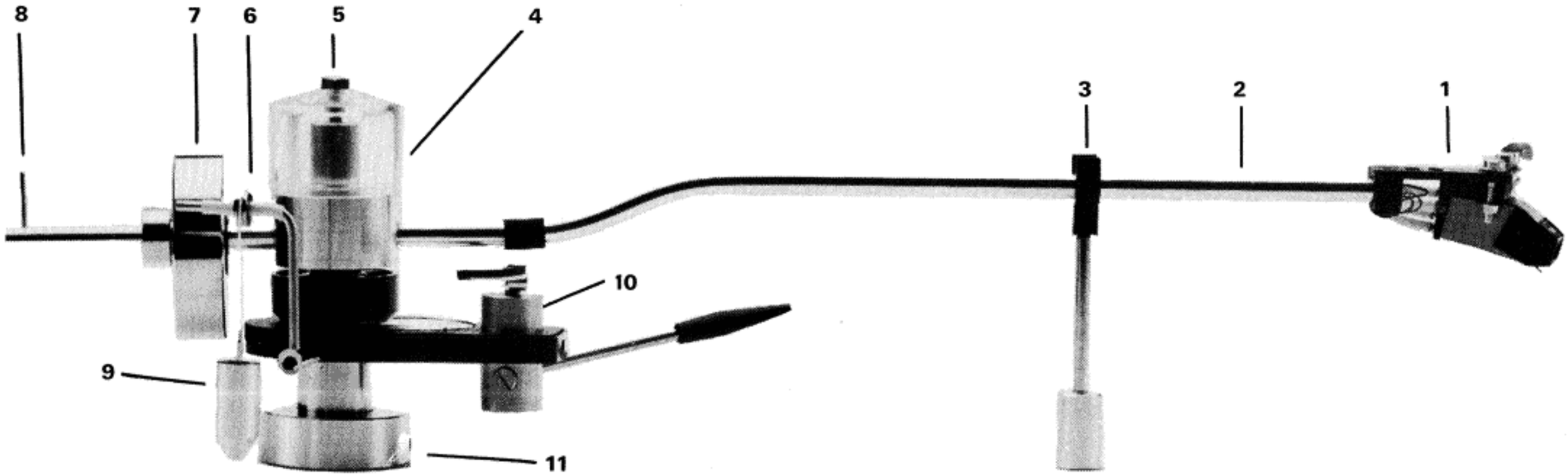
- The Sonus Formula IV tone arm is the product of extensive research over a period of several years, the need for such an item of audio equipment becoming increasingly evident with the significant advances in technology by the manufacturers of quality pickups which make special demands on tone arm parameters.

- Of particular significance in this design area are such factors as effective mass of arm and cartridge in combination (as related to stylus compliance), the bias compensation demand and distortion due to tracking error.

- The Sonus Formula IV is a product of scientific investigation, of correct geometric and physical specifications, which the user can confidently employ with the highest quality audio components.

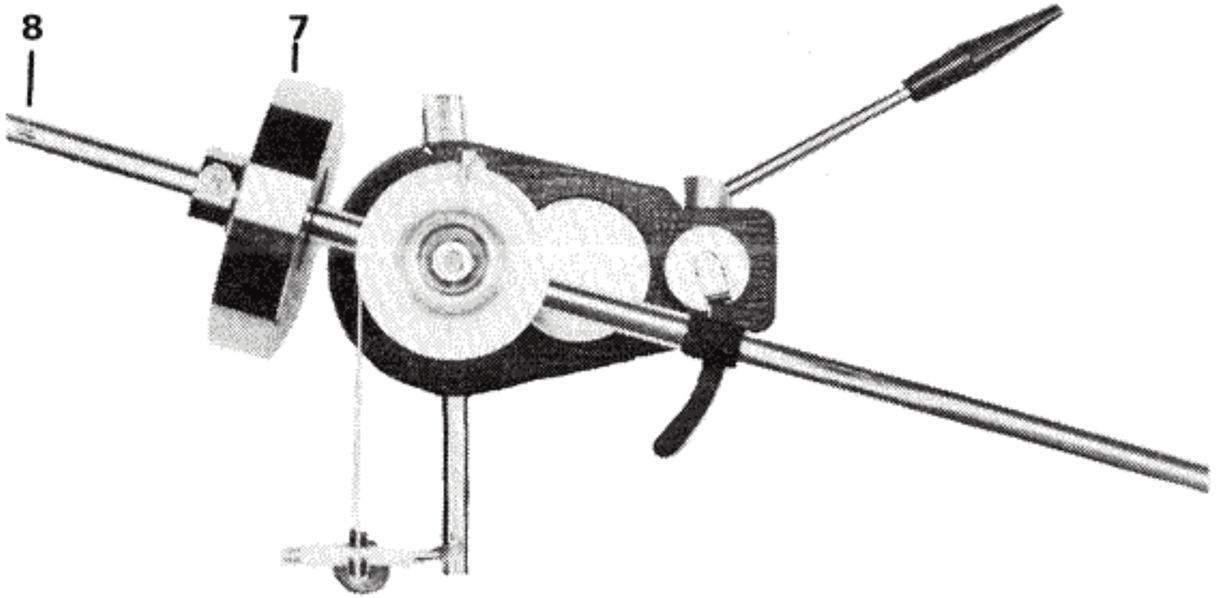
- It was the first of its kind and remains a superior choice for the purpose of approaching the ultimate transcription potential of high quality pickups.

VIEW 1

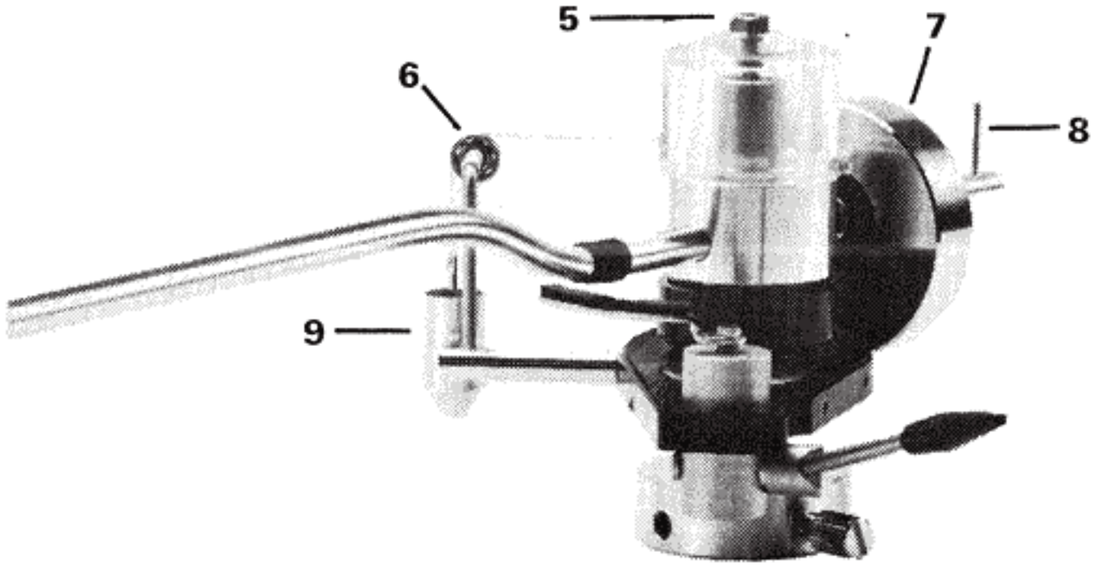


NUMBERED COMPONENTS

1. Skeletal Headshell
2. Aluminium Arm Tube
3. Arm Rest
4. Plexiglass Dome & Aluminium Hub
5. Adjustable Unipivot
6. Bias Bearing
7. Eccentric Counter Weight
8. Tracking Force Calibration Pin
9. Bias Bucket
10. Lifting and Lowering Device
11. Arm Mounting Boss



VIEW 2.



VIEW 3.

INSTALLATION PROCEDURES — Exercise Care

1. Using the template provided, scribe an arc 225 mm (8 7/8") on mounting board, with turntable spindle as center.

2. At a convenient place on the arc select a point at which the arm mounting boss (item 11 view 1) will be located. Arm requires clearance of 70 mm (2 3/4") to the rear, and 60 mm (2 3/8") to the right of the point chosen.

3. At the mounting point drill a hole 22 mm to 25 mm (7/8" to 1") diameter to accept arm mounting boss.

4. Position arm mounting boss in hole on mounting board but do not fully tighten hexagonal nut until after stylus calibration. (Note: set-screws in mounting boss should not project into its bore.)

5. Locate arm rest where convenient in 6 mm (1/4") hole.

6. Install cartridge in skeletal headshell (item 1 view 1) using cartridge mounting bolts to secure finger lift. The color code of leads is:—

WHITE	Left Channel Signal	RED	Right Channel Signal
BLUE	Left Channel Ground	GREEN	Right Channel Ground

7. Install the counter weight. The calibration pin (item 8 view 1) can be removed if the set-screw in the end of the rear arm tube is loosened about a quarter of a turn using the smallest of the Allen keys provided. Remember to retighten the set-screw to secure the pin after it has been replaced.

PRECISION ADJUSTMENTS:

1. Unscrew plexiglass dome from hub (item 4 view 1). Attached to this component are items illustrated in views 1 and 3 (item 5, adjustable pivot and item 9, bias bucket, connected by thread).

2. It will now be seen that the top of the central column, consists of a well with a sapphire rondel at the bottom of it. It can also be observed that a slot in the central column engages the aluminium tube (item 2 view 1). This slot should be disposed so that it faces the cartridge when midway through the recorded band of a 12" disc.

3. The well should be partly filled with silicone fluid supplied. (This fluid has a viscosity index of 60000 centistokes at 25°C.) The amount of fluid should be such that the level comes to a point 6 mm (¼") below the top before the pivot is inserted.

4. Before screwing the dome back in place, check to ensure that the pivot (item 5 view 1) is properly adjusted. The ground point of the pivot should be sighted in line with the groove around the outside of the transparent dome. The pivot is threaded and has a lock-nut for this purpose. This adjustment not only ensures freedom of lateral and vertical movement but also calibrates the point at which bias force is applied so that it is in the same horizontal plane as that on which the pivot point occurs.

5. With the dome in position the bias bucket (item 9 in views 1 and 3) should be arranged so that the thread to which it is attached is engaged in the groove of the dome and placed in the groove in the miniature bearing (item 6 views 1 and 3). The position of the miniature bearing is adjustable both vertically and horizontally so that the thread can be seen to be at 90^{o} to the hub when viewed from the rear and 90^{o} to the bearing when viewed from above.

6. **Vertical & Horizontal Balance.** These adjustments are made with the arm in equilibrium and it is convenient at this time to determine the tracking force eventually required. Attention is drawn to the tracking force calibration pin (item 8 views 1 and 2). This pin is located 60 mm to rear of the unipivot and the stylus will be located at 240 mm forward of the unipivot. Therefore there is a 4:1 ratio and if the arm is brought to equilibrium with a 4 gm weight on the rear pin its subsequent removal will apply a tracking force of 1 gm at the stylus. The arm acts as a beam balance and in combination with the 8 weights supplied a variety of tracking forces may be accurately determined. i.e.

Weight A	Quantity 2 each 0.5 gm
Weight B	Quantity 2 each 0.4 gm
Weight C	Quantity 4 each 2.0 gm

NB: These are nominal weights not tracking forces. The next chart shows how to use these weights.

Some combinations possible are shown below.

Tracking Force	Weights Required		
Grams	A	B	C
0.5	–	–	1
0.6	–	1	1
0.7	–	2	1
0.75	2	–	1
1.0	–	–	2
1.25	2	–	2
1.5	–	–	3
1.75	2	–	3
2.0	–	–	4

With the weights in position bringing the arm to vertical and horizontal balance is simply a matter of sliding the eccentric counterweight (item 7 in all 3 views) backwards or forwards for vertical balance and rotating it for horizontal balance. The small weights are then removed from the rear pin and with the stylus resting on a disc (preferably one not highly prized) adjust the height of the arm, using the knurled screw in the arm base until the arm tube is in a plane parallel to the disc. Recheck the horizontal balance by viewing the cartridge from the front to ensure that center line of cartrridge is perpendicular to the disc – adjust by rotation of counterweight if necessary.

7. **Bias Compensation.** The Sonus Formula IV bias compensation system provides a constant compensation as the cartridge traverses the record. The compensation force is adjusted by loading the small aluminium bucket with lead shot provided, so that the combined weight of bucket and shot applies the correct force.

The relationship between tracking force and bias compensation has been determined after exhaustive practical tests involving a large number of cartridges with widely varied tracking forces. The curve of tracking force: bias compensation is such that multi-radial styli tracking up to 1.5 gm have a virtually constant relationship. The ratio changes above 1.5 gm so as to be appropriate for spherical styli tracking at higher forces.

TRACKING FORCE (gm)	0.50	0.75	1.00	1.25	1.50	1.75
NUMBER OF LEAD SHOT	0	4	8	12	16	20

(A smear of silicone fluid or petroleum jelly on the lead shot will prevent them rolling out of the bucket.)

Ignore the use of anti-skating bands on test records which give too low a value of bias compensation when the stylus is in a recorded groove.

By minute adjustments of tracking force, height and bias compensation it is frequently possible to trace the highest levels of both high and low frequency tracks on test records.

8. **Tracking Error** — Use calibrator provided to minimize tracking error distortion on 7" and 12" discs.

    1. Place a 12" record on the platter then locate the calibrator over the platter spindle.
    2. Lower the stylus on to the intersection point A and check that the cartridge body is parallel to the set of lines. Repeat with stylus over intersection point B. The cartridge can be made parallel to both sets of lines by slight adjustments of arm boss in oversize mounting board hole and/or angulation of cartridge in headshell, as necessary. It is not important if the arm tube does not align exactly with the offset lines but it is important not to shift arm boss when tightening hexagonal nut.

9. **Hydraulic Lift** — Adjustable by means of set-screw to allow ample clearances. This set-screw is at front of platform and care should be taken not to strip thread by overtightening.

10. **Arm to Amplifier Cable.** When the arm is fitted to turntables having a shallow base, the wire cable clip provided should be fitted. The cable clip holds a sharp bend in the cable below the plug preventing the cable from pressing against the surface supporting the turntable and thus assists in isolating the turntable from feedback.

    Fitting the cable clip:—

    1. Place closed loop of clip over the end of 5 pin plug with open loop of clip towards the cable.
    2. Rotate clip around plug until ridge on plug aligns with small gap in the closed loop.
    3. Slide clip to cable end of plug.
    4. Bend cable sharply where it leaves plug.
    5. Tuck cable under open loop of clip.

ADDITIONAL SPECIFICATIONS:

Effective Length (Stylus Pivot)	—	240 mm (9.45")
Pivot	—	Hardened steel needle resting in concave jewel rondel surrounded by silicone fluid.
Pivot Friction	—	Below .005 gm at headshell.
Effective Mass (as seen by stylus)	—	4.05 gm.
Inertia Moment	—	5213 gm cm^2 with 5 gm cartridge. (This extremely low figure is largely the result of skeletal headshell and profile of counterweight.)
Tracking Error	—	0.15^{o}/cm. maximum.
Arm to Amplifier Wiring	—	4'6" (137 cm) of miniature coaxial cable with inherent capacitance of 0.8 to 0.9 pF per cm.

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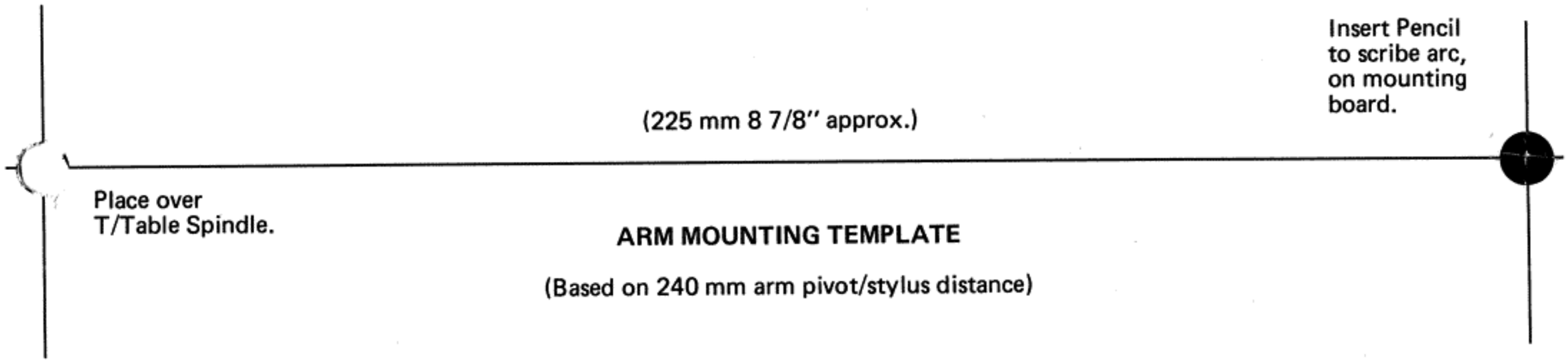
(See over)

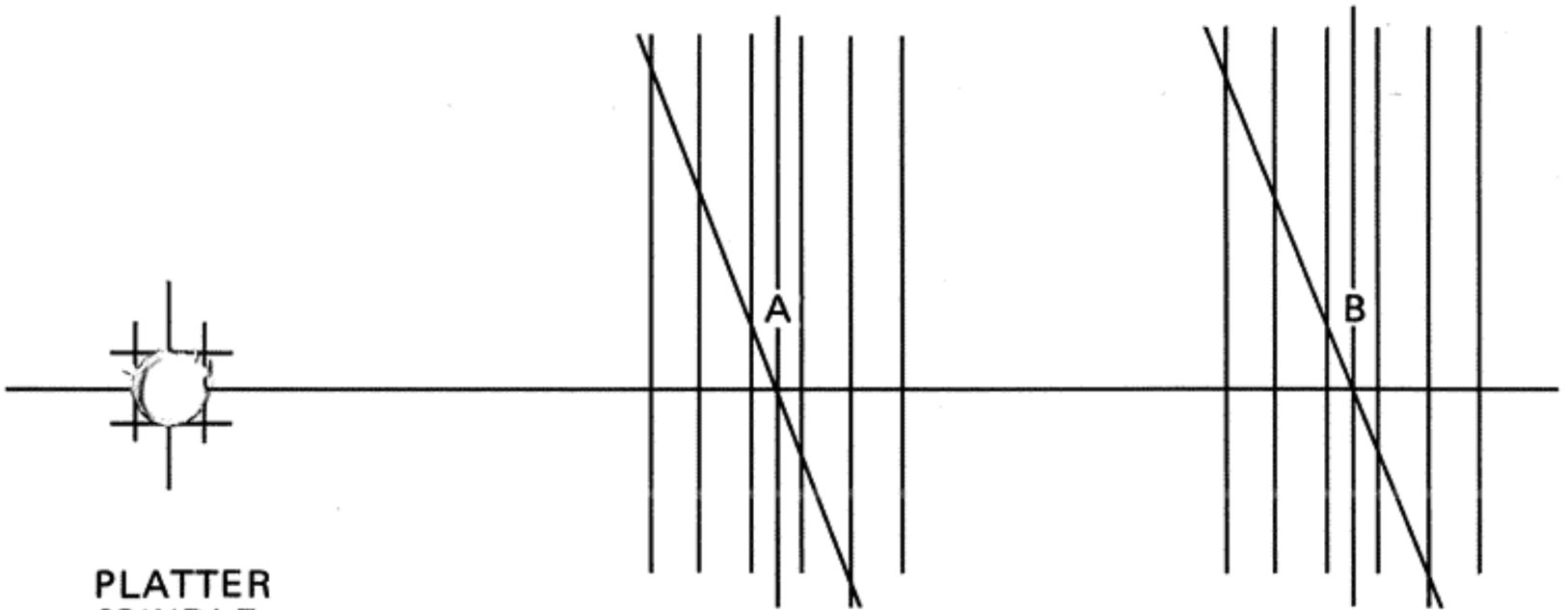


ARM MOUNTING TEMPLATE

(Based on 240 mm arm pivot/stylus distance)

CARTRIDGE

ALIGNMENT PROTRACTOR



Put stylus at intersections A and then B. The cartridge body should align with parallel lines at both points.

(See over)